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PETROLOGY.—*Granites of Central Spain.*[1] HENRY S. WASHINGTON, Geophysical Laboratory, Carnegie Institution of Washington.

According to Suess,[2] following Macpherson[3] and Calderon,[4] the Iberian Peninsula consists essentially of three main tectonic features: the Iberian Meseta or central plateau, bounded on the south by the folded Betic Cordillera, and on the north by the chain of the Pyrenees, which extends westward into the Cantabrian Cordillera. The central meseta consists of pre-Cambrian and Paleozoic rocks, into which granites and other igneous rocks were intruded in Carboniferous time.[5] The meseta is divided from east to west by the granitic Sierra de Guadarrama, north of Madrid, with its westerly continuation, the Sierra de Gredos, and Mesozoic and later rocks overlie the granites and the earlier sedimentary ones.

In many papers, mostly short, Calderon, Navarro and other Spanish petrographers have described the igneous rocks of the central meseta, and have shown that the granites are accompanied by quartz porphyry, diorite, diabase, teschenite, basalt, and some rarer types, especially a little nephelite basalt and limburgite. But, with one exception,[6] no analyses of any of these rocks seem to have been published. Some years ago Professor L. F. Navarro was good enough to send me a set of specimens of representative rocks from the Iberian Meseta, a kindness which

[1] Received July 13, 1926.

[2] SUESS, *The Face of the Earth*, (English translation) 2: 122. 1906.

[3] MACPHERSON, Anal. Soc. Espan. Hist. Nat. 30: 123. 1901.

[4] CALDERON, Ibid., 14: 131. 1885.

[5] There seems to be considerable diversity of opinion as to the details of the structure of the peninsula and the age of the intrusion of the granites. Cf. Dupuy de Lome and de Novo, Guias Geol. Lineas Ferreas, Cong. Geol. Int., xiv, Madrid-Irun, p. 24, Madrid-Sevilla, p. 8; 1926. I have been unable to consult Donvillé's "Spain," in the Handbüche der regionalen Geologie (1910).

[6] NAVARRO, Trab. Mus. Nac. Cien. Nat., Serie Geol. 12: 73. 1915.

is deeply appreciated. Chemical analyses were made of several specimens of granite, including one collected by me at Villalba, near the Escorial, in 1905. The present note embodies a study of these specimens.

All the four granites, analyses of which are given in Table 1, are much alike megascopically. They are simple biotite granite, very light in color, composed of white feldspar and quartz, with small flakes

TABLE 1.—GRANITES OF SPAIN

	(1)	(2)	(3)	(4)
SiO_2	69.83	69.86	68.56	70.38
Al_2O_3	15.07	15.32	14.66	14.71
Fe_2O_3	0.17	0.05	0.63	0.29
FeO	2.72	2.49	3.02	2.35
MgO	0.60	0.64	1.07	1.33
CaO	2.48	2.45	2.08	2.62
Na_2O	3.38	3.68	3.36	2.90
K_2O	3.90	3.79	5.27	4.58
H_2O+	0.50	0.22	0.32	0.15
H_2O-	0.14	0.12	0.05	0.06
TiO_2	0.94	0.93	1.43	1.25
P_2O_5	0.22	0.20	0.18	0.11
MnO	0.08	0.09	0.09	0.06
	100.03	99.84	100.72	100.79

Norms

	(1)	(2)	(3)	(4)
Q	28.26	26.52	22.02	27.72
Or	22.80	22.24	31.14	27.24
Ab	28.82	31.44	28.30	24.63
An	10.56	11.40	9.45	11.95
C	1.43	0.92	—	0.51
Hy	4.93	4.77	5.47	5.41
Mt	0.23	—	0.93	0.46
Il	1.82	1.82	2.74	2.43
Ap	0.67	0.34	0.34	0.34

(1) Biotite granite, I″.4.2.3″. Villalba, Madrid Province.
(2) Biotite granite, I″.4.2.3(4). Berrocal de Cerceda, Madrid Province.
(3) Biotite granite I(II).4.2.3. Almorox, Toledo Province.
(4) Biotite granite, I″.4.2.3. Baños de Penticosa-Pirenes, Huesca Province.
H. S. WASHINGTON, analyst

of black biotite. No muscovite is visible. They differ in granularity: those from Villalba and Barrocal de Cerceda, in the Sierra de Guadarrama, are 2 to 5 millimeter-grained; that from Baños de Penticosa, in Huesca, is finer, 1 to 2 millimeter-grained; and one from Almorox, northwest of Toledo, is coarser and somewhat porphyritic,

and is not quite fresh. The thin sections show typically granitic texture, all the rocks being made up of very slightly turbid orthoclase with a little oligoclase, considerable quartz, and a little pale brown biotite. No muscovite was seen in any of the sections. There are a few small zircons and rare prismoids of apatite, but no magnetite or epidote. There is no hornblende.

A specimen of rather coarse granite from Cercedilla, north of Madrid, with flesh-red feldspar and very little quartz, is too much weathered to merit further description or analysis.

The analyses presented in Table 1 are of interest as showing great uniformity in chemical composition. The variation in percentage of SiO_2 is within 2 per cent, and the amounts of the other constituents differ only slightly the one from the other. The percentage of K_2O is higher than that of Na_2O, but not very much so, while the amount of CaO is considerable and fairly constant. The norms show the absence of the diopside molecule, and the presence of hypersthene and (in Nos. 1, 2, and 3) corundum, these features being in harmony with the presence of biotite alone as the mafic mineral, and the absence of hornblende or augite.

It is clear, from the microscopical examination and from the analyses and norms, that these granites are not alkalic, but are calci-alkalic, and sodipotassic, as is shown by the symbol, I.4.2.3, of the rang in which they fall. This calci-alkalic character is in line with the fact that in the central plateau "quartz porphyry," quartz diorite, diorite, and diabase are common, although much less abundant than granite, while peralkalic and very sodic rocks, such as syenite, nephelite syenite, and tinguaite, are very rare or are unknown.

These analyses of granite give an idea of the general magmatic character of the Iberian Meseta, especially when the great uniformity among the specimens from different localities is considered, and when the granites are taken in connection with the associated rocks. It is clear that the magmatic character of the great central Spanish horst differs very much from that of the igneous (plutonic and volcanic) areas that occur on and near the coasts, on all sides around the central mass. Many of these have been studied petrographically, with chemical analyses, and they are fairly well known. They are alkalic or sub-alkalic, and mostly with a decidedly sodic character. They include: the granites of Guipuzcoa[7] and the trachyte, etc., of Monte

[7] TERMIER, Bull. Soc. Geol. France 7: 13. 1907.

Axpe near Bilbao,[8] on the north; the volcanoes of Olot and Gerona,[9] with basalt, nephelite basanite, and limburgite, at the northeast; the rhyolites, dacites and andesites of Cabo da Gata [10] and the peculiar alkalic rocks of Murcia,[11] in the southeast; the nephelite syenite mass, with its accompanying dikes in Algarve, Portugal,[12] at the southwest; and the riebeckite syenite mass of Alter Pedroso, in Alemtejo,[13] on the west.

Fernandez Navarro[14] has shown that recent lavas do not occur in the central meseta, except for one small occurrence of nephelite basalt in the Sierra de Guadarrama, but that a series of Tertiary and more recent small eruptions of nephelite basalt and of limburgite have taken place along its periphery. He also points out some of the coastal occurrences of more varied rocks.

It thus appears that, petrologically, the Iberian Peninsula consists essentially of a main central massif of dominantly granitic rocks, of approximately average composition, surrounded on its folded and faulted borders by discontinuous occurrences of more alkalic, and mostly sodic, igneous rocks. In these respects it does not appear to be unique, but is analogous to several other horsts, as well as some of the ancient shields, and even some of the continental masses.

The matter cannot be discussed fully in this brief note, but a few examples may be given.[15] These include: the Canadian shield, with alkalic rocks in Ontario and Quebec; the Brazilian shield, with alkalic rocks in eastern Brazil and Paraguay; the Fenno-Scandian shield, with alkalic rocks at Christiania, Kola, and elsewhere; and apparently the continent of Africa, where the coastal igneous rocks are mostly sodic, while the interior is largely granitic.

Such distribution of distinctly sodic rocks around a central granitic massif, if it be indeed real, brings to mind Harker's hypothesis of differentiation by expulsion of residual magma through crustal stresses, with the production of alkalic, and especially sodic, rocks. It would not be favorable to the reference of igneous rocks to Atlantic and Pacific branches, nor to belief in the derivation of alkalic rocks from basaltic ones by assimilation of limestones.

[8] WASHINGTON, U. S. Geol. Survey, Prof. Paper 99: 271. 1917.

[9] CALDERON, CAZURRO, and NAVARRO, Mem. Soc. Espan. Hist. Nat. 4, 5: 1907; WASHINGTON, Amer. Journ. Sci. 24: 217. 1907.

[10] OSANN, Zeitschr. deutsch. geol. Ges. 43: 325, 688. 1891.

[11] OSANN, Rosenbusch Festschr. 263. 1906.

[12] KRATZ-KOSCHLAU and HACKMANN, Tsch. Min. Pet. Mitth. 16: 197. 1896.

[13] LACROIX, Compt. Rend. Acad. Sci. 163: 279. 1916.

[14] FERNANDEZ NAVARRO, Compt. Rend. Acad. Sci. 162: 252. 1916.

[15] The distribution suggested here was briefly alluded to in CLARKE and WASHINGTON, U. S. Geol. Survey, Prof. Paper 127: 43, 53, 55, 63. 1924.

BOTANY.—*The genus* Calatola.[1] PAUL C. STANDLEY, U. S. National Museum.

In 1923 the writer published in the Trees and Shrubs of Mexico[2] a new genus of Mexican trees, *Calatola*, which was referred doubtfully to the family *Icacinaceae*. It had been intended to publish previously a fuller account of the genus, with an illustration of one of the species, and a description of a third species, native of Costa Rica, but the publication of the paper was delayed. During a visit to Costa Rica in 1925–26 further material of the Costa Rican tree was obtained, together with interesting data concerning its economic applications. The purpose of the present paper is to give an account of the information now available with regard to the genus.

CALATOLA Standl. Contr. U. S. Nat. Herb. **23**: 688. 1923.

Trees; leaves alternate, petiolate, the blades membranaceous or coriaceous, entire; flowers dioecious, very small, the staminate bracteate, arranged in long slender solitary axillary spikes, the pistillate axillary, solitary and pedunculate or in few-flowered spikelike inflorescences; calyx of the staminate flower small, 4-lobate; corolla of the staminate flowers 4-parted, the lobes concave, valvate, 1-costate on the inner surface and sparsely villous along the costa; stamens 4, alternate with the corolla lobes, erect, basifixed, the filaments very short, adnate to the corolla, the anthers oblong, 2-celled, dehiscent by lateral slits; calyx of the pistillate flower 4-lobate; ovary 1-celled; fruit drupaceous, large, globose, oval, or obovoid, the flesh thick, the stone thick and osseous, bicristate and with numerous irregular reticulate dentate crests over the whole surface; seed large, the surface irregularly convolute, the embryo large, the endosperm copious, fleshy.

Type species, *Calatola mollis* Standl.

In flower characters the genus seems to agree reasonably well with the family *Icacinaceae*, but in general appearance it does not much resemble other members of the family. The strictly spicate character of the staminate spikes, which strongly suggest catkins, is not matched in other genera of the *Icacinaceae*, and the fruit also exhibits certain peculiarities. The flowers, however, are much like those of the common representatives of the family. Among the American genera, the only ones that appear to be related are *Mappia* and *Kummeria*, both of which differ in their long filaments and 5-parted flowers.

Although the material at hand is rather ample, the result of its study has been far from satisfactory, and study of the trees in the forest has failed to give a better clue to their relationship. It may be that further study will

[1] Published by permission of the Secretary of the Smithsonian Institution. Received July 29, 1926.

[2] Contr. U. S. Nat. Herb. **23**: 688. 1923.

necessitate the reference of the genus *Calatola* to some other family, or even its recognition as the type of a distinct family.

The generic name *Calatola* is the vernacular name of one of the Mexican species.

It is of interest to record here the fact that Dr. E. W. Berry has published[3] recently the description of a genus, *Calatoloides*, based upon fossil fruits from the Wilcox Group of the lower Eocene strata of southwestern Texas. Dr. Berry states that, so far as he is aware, no representative of the family *Icacinaceae* has ever before been found fossil. The fruit of *Calatoloides eocenicum*, as figured, is strikingly like that of the genus *Calatola*, but only half as large.

KEY TO THE SPECIES

Leaves densely soft-pubescent beneath over the whole surface.
1. C. mollis.

Leaves glabrous beneath, or densely barbate in the axils of the lateral nerves.

Leaves glabrous beneath or nearly so, not at all barbate; staminate spikes very dense.....2. C. laevigata.

Leaves densely barbate beneath in the axils of the lateral nerves; staminate spikes loosely flowered and somewhat interrupted.
3. C. costaricensis.

1. CALATOLA MOLLIS Standl. Contr. U. S. Nat. Herb. 23: 689. 1923. Fig. 1.

Tree, the branches terete, densely pilose when young with short fulvous-grayish hairs; petioles stout, 3–4.5 cm. long, pilose; leaf blades oval-elliptic, oblong-oval, or oblong-obovate, 21–30 cm. long, 8–14 cm. wide, obtuse or rounded at base, acute or abruptly short-acuminate at apex, when young short-pilose on the upper surface but soon glabrate except along the nerves, densely short-pilose beneath, the costa slender, prominent, the lateral nerves 7–9 on each side, ascending at an angle of about 50°, subarcuate, laxly anastomosing near the margin; staminate spikes 8–21 cm. long, about 6 mm. in diameter, densely flowered, the rachis short-pilose, the bracts small, ovate-acuminate; calyx densely white-pilose outside, glabrous within, the lobes oblong-oval, obtuse; corolla 2 mm. long, the lobes obtuse, sparsely villous outside along the costa; anthers 1.2 mm. long, the filaments about 0.3 mm. long; pistillate flowers solitary; peduncle of the fruit (in one immature specimen) 1.5 cm. long; fruit densely and closely tomentose, the stone 5–5.5 cm. long, 4–4.5 cm. in diameter, covered outside with very numerous thin, sharp, irregularly dentate, reticulate crests, smooth and brown within; seed about 3 cm. long, brownish.

MEXICO: Zacatlán, Puebla, Apr. 3, 1913, *F. Salazar*, type. Tlatlanquitepec, Distrito de Tepeji, Puebla, *collector unknown*.

This tree is well known in the State of Puebla, and has been mentioned a few times in literature, but without a Latin name. It has been referred in at least one instance to the *Juglandaceae*, doubtless because of the nutlike fruits, which somewhat suggest walnuts. The staminate spikes, likewise,

[3] *Additions to the flora of the Wilcox Group*, U. S. Geol. Surv. Prof. Paper 131: 14. *pl. 14, f. 3–5*. 1923.

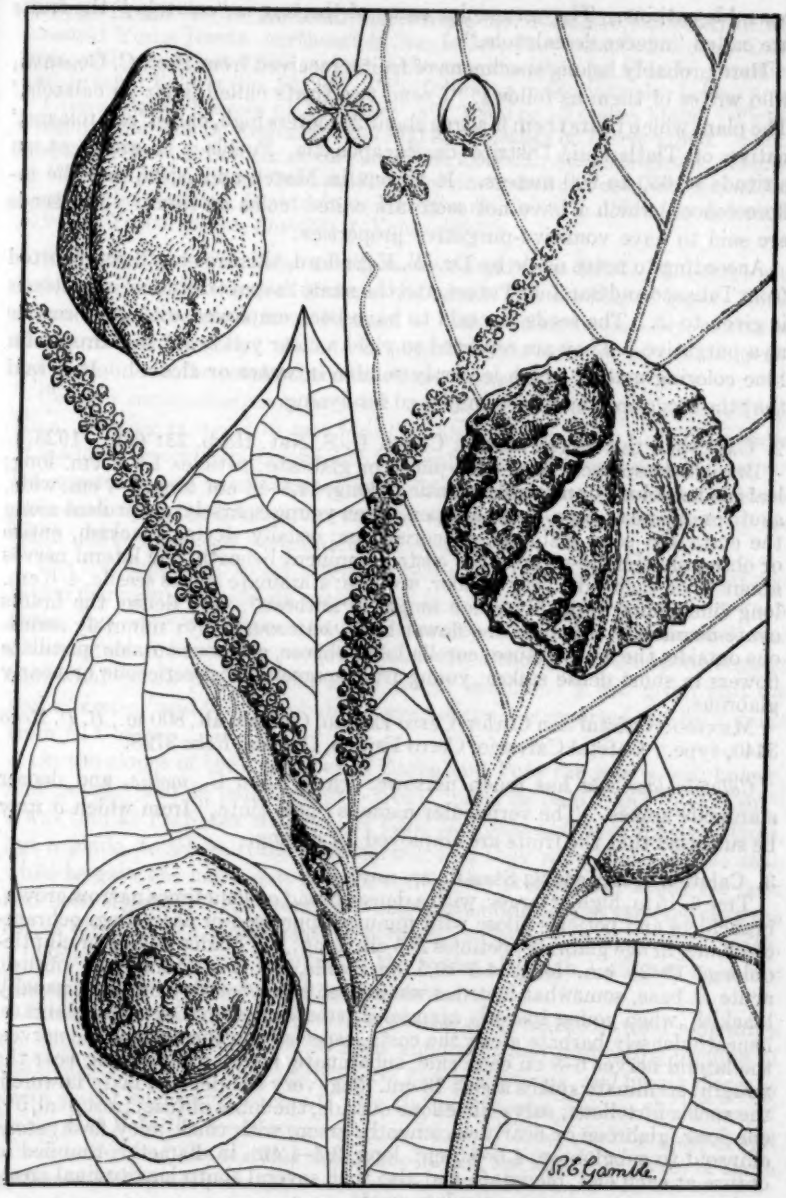

Fig. 1.—*Calatola mollis*. Natural size; floral details × 2.

resemble catkins. The vernacular name of the tree is "calatola;" the fruits are called "nueces de calatola."

Here probably belong specimens of fruits, received from Prof. C. Conzatti, who writes of them as follows: "I send two fruits called 'nuez de calatola.' The plant which bears them is a tree about 20 meters high, called 'calatolazno,' native of Tlatlanqui, Distrito de Zacapoaxtla, Puebla. It grows at an altitude of 650 to 900 meters. It flowers in March and April, and the inflorescences, which I have not seen, are called 'colas de ratas.' The seeds are said to have vomitive-purgative properties."

According to notes made by Dr. W. E. Safford, this tree has been reported from Tabasco and San Luis Potosí, and the name "zapote de mono" sometimes is given to it. The seeds are said to have been employed with good results as a purgative. They are reported to yield a clear yellow oil, and drops of a blue coloring matter which is partly soluble in water or alcohol. It is said that the seeds are sometimes employed for dyeing.

2. CALATOLA LAEVIGATA Standl. Contr. U. S. Nat. Herb. **23**: 689. 1923.

Branchlets sparsely appressed-pilose or glabrate; petioles 1.5–2 cm. long; leaf blades oblong or narrowly elliptic-oblong, 11.5–16 cm. long, 4–7 cm. wide, acute or obtuse at base, acute at apex, when young sparsely puberulent along the costa but soon glabrous, subcoriaceous, usually drying blackish, entire or obscurely sinuate-serrate, the costa prominent beneath, the lateral nerves about 10 on each side, very slender, arcuate; staminate spikes sessile, 4–6 cm. long (immature; probably much longer in anthesis), very dense, the bracts ovate-acuminate, equaling the flower buds, sericeous; calyx minutely sericeous outside, the lobes obtuse; corolla lobes obtuse, glabrous outside; pistillate flowers in short dense spikes; young fruit sparsely short-sericeous or nearly glabrous.

MEXICO: Cafetal San Carlos, Cerro Espino, Oaxaca, alt. 800 m., *B. P. Reko* 3440, type. Cafetal Calvario, Cerro Espino, Oaxaca, *Reko* 3728.

Calatola laevigata has much narrower leaves than *C. mollis*, and denser staminate spikes. The vernacular name is "palo tinta," from which it may be surmised that the fruits are employed for dyeing.

3. **Calatola costaricensis** Standl., sp. nov.

Tree 6–15 m. high or larger, with a dense, broad or sometimes narrow crown, branchlets and petioles pilose with minute, appressed or ascending, ochraceous hairs, in age glabrate; petioles 2–5 cm. long; leaf blades oblong or elliptic-oblong, 10–25 cm. long, 4.5–10.5 cm. wide, short-acuminate to obtuse, acute at base, somewhat lustrous when fresh but when dry dull and usually blackish, when young sparsely appressed-pubescent above but soon glabrate, beneath densely barbate along the costa, especially in the axils of the nerves, the lateral nerves 6–8 on each side, subarcuate, laxly anastomosing near the margin; staminate spikes about 13 cm. long, very slender and laxly flowered, the rachis hirtellous; calyx hirtellous outside, the lobes obtuse; fruit oval, 5–7 cm. long, glabrous or nearly so, smooth, green, with thick juicy flesh; stone ellipsoid to subglobose, 4.5–6.5 cm. long, 3.5–4 cm. in diameter, rounded or obtuse at each end, bicristate and also with several sharp longitudinal crests and numerous transverse reticulate crests.

Type in the U. S. National Herbarium, no. 1,251,510, collected in wet forest at Yerba Buena, northeast of San Isidro, Provincia de Heredia, Costa Rica, altitude about 2,000 meters, February 28, 1926, by Paul C. Standley and Juvenal Valerio (no. 50,000). The following collections also belong here: COSTA RICA: Forests of El Copey, alt. 1,800 m., *Tonduz* 11896. Viento Fresco, Provincia de Alajuela, alt. 1,800 m., *Standley & Torres* 47895. Santa María de Dota, Provincia de San José, alt. 1,500 m., *Standley* 42838; *Standley & Valerio* 43359. Near Quebradillas, Provincia de San José, *Standley* 42865. Cerro de las Caricias, Provincia de Heredia, alt. 2,000 m., *Standley & Valerio* 51943. Yerba Buena, *Standley & Valerio* 49028.

Here may be referred also two stones received from Dr. E. W. Berry, who found them on the beach in Panama at Panama and San Miguel bays. These stones may have come from Panama or Costa Rica, or possibly, of course, from some other region. It is to be expected that some species of the genus will be found in the mountains of northern Panama.

Calatola costaricensis is a frequent tree in the mountains of central Costa Rica, growing in moist or wet forest at altitudes of 1,500 to 2,000 meters. It is a large tree with rather smooth but scaly bark, and there is nothing about its appearance to attract attention. The curious fruits, which often are abundant upon the ground, are noticed immediately, however, for they are quite unlike any other with which one is familiar.

The tree first came to my attention this year at Santa María, where it was rather common. The fruits were shown to several persons, all of whom knew them, but were uncertain as to their name. The name "duraznillo" was given by some, but this is probably incorrect, although the stones do suggest somewhat peach pits, as that name would indicate. I was given also the name "erepe," and this is probably correct, since it is reported also by Tonduz from El Copey.

On the slopes of the volcanoes of Barba and Poás the tree is well known, and called "palo de papa" (potato tree), "papa de palo," and "palo azul." I was told at Fraijanes that *palo de papa* and *palo azul* were different trees, but a guide, to whom fruits were shown, said they were those of *palo azul*, while he gave the name *palo de papa* for the dry stones from which the flesh had been stripped. The name *palo azul* probably refers to the fact that the leaves often have a bluish cast, or perhaps to the fact that, as in *C. mollis*, a blue coloring material is found in the seeds, although I did not note any blue coloration in the seeds that we examined.

The wood of this tree is said to be of good quality and to be used sometimes for construction purposes. The most important and interesting product of the tree is the seeds. They are white, of firm consistency, and have a pleasant sweet flavor suggesting coconut. By the people who live on the slopes of Barba and Poás the seeds are roasted and eaten. They are also ground and mixed in tortillas, the tortillas thus made having the agreeable flavor of those prepared with grated cheese.

Prof. Valerio and myself ate some of the fresh seeds found at Yerba Buena,

and found them very good. We also ate roasted seeds, but found them less agreeable, perhaps because they had not been roasted properly.

While Mr. H. Pittier was in Washington recently, *Calatola* seeds were shown him. He recognized them immediately, and recounted that once, while lost in the mountains of Costa Rica, and without food, he ate some of the seeds and was made very sick by them. It seems probable, therefore, that the seeds of *C. costaricensis* possess the properties ascribed to those of the Mexican species.

The stones of *Calctola costaricensis* exhibit considerable variation in size and form, those from the region of Santa María being longer and narrower than those from the central cordillera. It may be that when more ample material has been assembled, it will be found that two species are represented in Costa Rica.

BOTANY.—*Five new American* Melampodiinae.[1] S. F. BLAKE, Bureau of Plant Industry.

This paper contains descriptions of five new tropical American *Asteraceae* of the subtribe *Melampodiinae*, as well as a record of range extension for a unique species of *Ichthyothere* described in this Journal several years ago.

Clibadium laxum Blake, sp. nov.

Section *Euclibadium;* plant strigillose; leaves large, ovate, long-petioled, serrate, submembranous; heads medium-sized, remote, in very loose divergent-branched panicles; phyllaries 1–2; pistillate flowers 9, hermaphrodite 10–13; fertile ovaries pubescent at apex.

"Branched herb, 2–2.5 m. high;" stem stout (7 mm. thick above), pithy, indistinctly about 6-angled, rather densely short-strigose; leaves opposite, those subtending the upper branches of the inflorescence alternate; petioles strigillose, sulcate above, margined above by the decurrent leaf blades, the naked portion 2.5–9 cm. long; blades ovate, those below the inflorescence more broadly so, 23.5 cm. long, 15 cm. wide, acuminate, at base truncate-rounded and shortly decurrent on the petiole, those subtending the principal branches of the inflorescence long-acuminate, cuneate at base, 14–20 cm. long, 6–9 cm. wide, all thin, nearly equally green on both sides, coarsely and bluntly serrate (teeth mucronulate-tipped, depressed, 2–3 per cm.), lepidote-strigillose and barely roughish above (the hairs mostly deciduous except for the bases), sparsely strigillose beneath, tripli- or quintuplinerved within 4.5 cm. of base, the veins prominent beneath, the principal veinlets prominulous; panicles many-headed, very loose, ternately divided, about 17 cm. wide, strigillose, on peduncles 8 cm. long or less, the bracts subulate-filiform, 2–6 mm. long; heads sessile, remote (usually 3–10 mm. apart), in flower oblong, 6 mm. long, 3.5 mm. thick, in fruit depressed-globose, 3.5 mm. long, 4.5 mm. thick; phyllaries 1 or 2, ovate to suborbicular-ovate, 3 mm. long, 2.2 mm. wide, acutish to obtuse, 5–7-nerved, ciliate, sparsely strigillose, whitish, subscarious; pistillate flowers 9, all paleate, the hermaphrodite 10–13, all but the 2 or 3

[1] Received July 30, 1926.

innermost paleate; pales of the pistillate flowers suborbiculate-ovate, up to 4 mm. long, 2.8 mm. wide, acutish or obtuse, about 6-nerved; pales of the hermaphrodite flowers oval-oblong, blunt, 1.8–2.8 mm. long, 3–5-nerved, ciliate; pistillate corollas white, obscurely glandular at apex, unequally 3-toothed, 2 mm. long; hermaphrodite corollas white, 3.2 mm. long, hispidulous on the teeth; achenes suborbicular-obovoid, 1.8–2 mm. long, 1.6–1.8 mm. wide, obcompressed, fuscous, hispidulous at apex; sterile ovaries long-pilose especially toward apex, 1–1.2 mm. long.

ECUADOR: Teresita, 3 kilometers west of Bucay, Province of Guayas, altitude 270 meters, 5–7 July 1923, *A. S. Hitchcock* 20430 (TYPE no. 1,195,383, U. S. Nat. Herb.).

The only close ally of this species is *Clibadium remotiflorum* O. E. Schulz, of Brazil and Bolivia, which has 4 or 5 phyllaries, larger heads, smaller leaves, and shorter petioles.

Clibadium microcephalum Blake, sp. nov.

Section *Euclibadium;* plant strigillose; leaves large, ovate, long-petioled, membranous, depressed-serrate; heads tiny, sessile or subsessile, crowded in small glomerules; pistillate flowers 3, hermaphrodite 3–4; fertile ovaries pubescent at apex.

"Shrub;" stem subangulate, striatulate, strigillose, 5 mm. thick just below the inflorescence; leaves (only uppermost seen) subopposite; petioles strigillose, margined above by the narrowly decurrent leaf blades, the naked portion 4–5 cm. long; blades ovate, 24–28 cm. long, 11.5–14 cm. wide, acuminate, cuneate or cuneate-rounded at base and then narrowly decurrent on the upper part of the petiole, depressed-serrate (teeth mucronulate-tipped, 1–3 per cm.), about equally green on both sides and sparsely strigillose, roughish above and there with the hairs mostly deciduous except for their lepidote bases, quintuplinerved within about 4 cm. of base, the principal veinlets prominulous beneath, scarcely so above; panicles ternate at apex of stem, many-headed, flattish, 7–10.5 cm. wide, densely strigillose, ternately divided, on peduncles 3.5–11 cm. long, the heads in glomerules of 5–8, these mostly 4–7 mm. thick; bracts mostly subulate and about 2 mm. long; heads oblong-cylindric, 5 mm. long (including the corollas) 2 mm. thick; phyllaries 2 or 3, suborbicular-ovate, obtuse, 3–6-nerved, subscarious, ciliolate, essentially glabrous dorsally, 2.5–3 mm. long, 2–2.8 mm. wide, sometimes with a much smaller triangular-ovate acutish bractlet at base; pistillate flowers 3, all paleate, the hermaphrodite 3 or 4, usually epaleate, rarely 2 paleate; pales of the pistillate flowers similar to the phyllaries; pistillate corollas white, glabrous, minutely 4-toothed, 2.2 mm. long; hermaphrodite corollas white, finely hispidulous on the teeth, 3.2 mm. long; submature fertile ovaries obovoid, obcompressed, hispidulous above, 2 mm. long, 1.2 mm. wide; sterile ovaries ascending-pilose throughout, 2 mm. long.

ECUADOR: Valley of Pastaza River, between Baños and Cashurco, Province of Tungurahua, altitude 1300–1800 meters, 25 Sept. 1923, *A. S. Hitchcock* 21873 (TYPE no. 1,195,714, U. S. Nat. Herb.).

Nearest *Clibadium glomeratum* Greenm., of Costa Rica, which is immediately distinguished by its pilose-tomentose branches and inflorescence.

Ichthyothere connata Blake, sp. nov.

Glabrous throughout; leaves opposite, ovate, sessile, conspicuously connate

at base, entire, thick, 7 or 9-plinerved; heads few, sessile in a terminal cluster; pales with erose acutish tips.

Herbaceous, simple or subsimple, 35 cm. high and more; stem stout (3–5 mm. thick), striate-angled, apparently glaucescent; internodes 3–7 cm. long, usually shorter than the leaves; leaves ovate or oval-ovate, 5.5–8 cm. long, 3–4.2 cm. wide, not reduced above, acute, at base clasping and connate for 2–6 mm., stiffly coriaceous, 7 or 9-plinerved from base and prominulous-reticulate, apparently glaucescent; heads about 7 mm. high, 5 mm. thick, about 3 or 4 in a terminal cluster, subtended by normal leaves; phyllaries suborbicular, obtuse, glabrous, strongly about 10-ribbed, the narrow thin margins erose above with subglandular teeth; pales acutish, subglandular-erose, strongly about 3-nerved.

BRAZIL: "Chapadao dos Veadeiros ou de Porto Leguro," Goyaz, Jan.–Feb. 18—, *A. Glaziou* 21648 (type in Kew Herb.; photograph and fragment, U. S. Nat. Herb.)

A very distinct species, nearest *Ichthyothere latifolia* (Benth.) Gardn.,[2] but readily distinguished by its conspicuously connate-clasping leaves. The type number was listed by Glaziou[3] as *I. suffruticosa* Gardn., a species with elongate-lanceolate leaves. The sheet examined, on loan from the Kew Herbarium, now bears only two heads, which it has not seemed advisable to injure by dissecting. The stem and leaves appear to have been glaucous, but this appearance may be due to the deposition of a very thin layer of the corrosive sublimate used in poisoning.

ICHTHYOTHERE SCANDENS Blake, Journ. Washington Acad. Sci. 11: 301. *fig. 1.* 1921.

This species, originally described from a collection (no. 3430) made by Dr. F. W. Pennell at Libano, Department of Tolima, Colombia, altitude 1100–1300 meters, in 1917, has since been found to have an extensive range. It was collected many years ago at Colonia Tovar, Venezuela, by Fendler (no. 2560, in Gray Herb.), and has been found several times by Mr. Henry Pittier in Venezuela (as at El Portachuelo, State of Miranda). Prof. A. S. Hitchcock collected it (no. 21881) in the valley of the Pastaza River, 8 hours east of Baños, Province of Tungurahua, Ecuador, alt. 1300–1800 meters, on 25 Sept. 1923. A most unexpected extension of range is shown by typical specimens collected in the vicinity of Guápiles, Province of Limón, Costa Rica, alt. 300–500 meters, 12–13 March 1924, by Mr. Paul C. Standley (no. 37148). The last occurrence establishes the first record for the genus outside the South American continent.

The original specimen was described by the collector as a shrubby vine. Later collectors have called it a shrub or herb 4–5 ft. high. It is probable that this species varies in habit, like many other tropical plants.

[2] This name, based on *Latreillea latifolia* Benth., was properly published by GARDNER, Lond. Journ. Bot. 7: 424. 1848. The specimen listed (but not described), *Gardner* 3273, belongs to *I. terminalis* (Spreng.) Blake (*I. cunabi* Mart.). BAKER, Fl. Bras. 6[2]: 154. 1884, has referred Gardner's name to the synonymy of *I. cunabi*, and remade the combination *I. latifolia* for Bentham's plant.

[3] Mém. Soc. Bot. France 3: 409. 1910.

Polymnia latisquama Blake, sp. nov.

Tall herb; stem essentially glabrous; leaves ovate, large, firm-papery, coarsely serrate, triplinerved, short-decurrent on the upper part of the petiole; heads solitary, long-peduncled; outer phyllaries 4, ciliolate, glabrous dorsally, suborbicular-ovate, about 1.8 cm. wide; rays yellow, about 8, the lamina about 3 cm. long.

Herb, 1.5–3 m. high; stem rather slender (2.5–3.5 mm. thick), simple or dichotomous at apex, striatulate; upper internodes 5.5–9 cm. long; leaves opposite; petioles cuneate-winged at apex, hirsute-pilose with sordid many-celled hairs, narrowly connate at base, the naked portion 1–4.5 cm. long; leaves ovate or the lower triangular-ovate, 9–23 cm. long, 4.5–15 cm. wide, acuminate, often slightly falcate, at base cuneate to (in the larger leaves) subtruncate, decurrent on the petiole for 0.5–2.2 cm., coarsely serrate with unequal teeth (1–3 per cm.) tipped with blunt somewhat callous mucros about 0.5 mm. long, above deep green, smooth, essentially glabrous, hirsute-ciliate with sordid many-celled hairs, beneath scarcely lighter green, glabrous or with a few hairs along the veins, triplinerved and beneath prominulous-reticulate; peduncles solitary, terminal, glabrous, naked, 7–9 cm. long; heads about 6 cm. wide; disk 2–2.5 cm. thick; outer phyllaries 4, decussate, suborbicular-ovate, obtuse to acute, coriaceous, sparsely hirsute-ciliate, glabrous dorsally, about 9-nerved, united for about 5 mm. at base, subcordate, 2–2.3 cm. long (from base of involucre), 1.7–2 cm. wide; inner phyllaries (subtending the rays) about 8, ovate, short-acuminate, submembranous, ciliate, stipitate-glandular on back, at maturity about 13 mm. long, 8 mm. wide; rays "bright yellow," pilose on tube and on nerves of back, fertile, the tube about 1.5 mm. long, the lamina oblong-elliptic, 3.5 cm. long, 9 mm. wide; disk flowers very numerous, infertile, their corollas yellow, sparsely hirsute on tube, 1 cm. long (tube 2.5 mm., throat thick-cylindric, 5.5 mm., teeth ovate, papillose-margined, 2 mm. long); pales oblong, membranous, obtuse, bluntly 1-dentate on each side below apex, somewhat pilose and stipitate-glandular, about 6-nerved, 9 mm. long, 3 mm. wide; ray achenes (scarcely mature) plump, obcompressed, glabrous, multistriatulate especially on back, epappose, 6 mm. long, 5 mm. wide; style of disk flowers 2-parted, the branches densely hirsute-pilose, with linear subulate hispidulous appendages.

COSTA RICA: Along stream, southern slope of Volcán de Turrialba, near the Finca del Volcán de Turrialba, alt. 2,000–2,400 meters, 22 Feb. 1924, *P. C. Standley* 35340 (TYPE no. 1,227,055, U. S. Nat. Herb.); wet thicket, Río Birrís, southern slope of Volcán de Irazú, 23 Feb. 1924, *Standley* 35412.

The closest relative of this species is *Polymnia quichensis* Coulter, of Guatemala, which has more or less densely sordid-pilose stem and peduncles, narrower leaves with more tapering base, rough above and rather densely sordid-pilose on the veins and veinlets beneath, smaller, ovate, acuminate phyllaries (1–1.5 cm. long, 8–9 mm. wide), and much shorter rays (lamina about 1.2 cm. long).

Melampodium cornutum Blake, sp. nov.

Slender annual; stem hirsutulous in lines, without long hairs; leaves slender-petioled, rhombic-ovate, crenate-serrate, membranous; heads small, sessile or subsessile, axillary and terminal; phyllaries 5, free nearly to base; rays minute; fruit with ovate appendage prolonged into a long slender recurved horn.

Plant about 15 cm. high, few-branched above, the branches long and divergent; leaves opposite; petioles of the larger leaves slender, 8–13 mm. long, narrowly marginate above, hirsutulous on margin; blades of the larger leaves rhombic-ovate, 2–3.2 cm. long, 1.2–2.3 cm. wide, acute, acutely cuneate at base, crenate-serrate above the entire cuneate base (teeth 5–7 pairs), triplinerved, sparsely hirsute-pilose above and on margin, beneath scarcely paler and practically glabrous; branch leaves smaller, short-petioled, often obtuse; heads about 4 mm. wide in anthesis; outer phyllaries 5, oval or oval-oblong, membranous-herbaceous, free nearly to base, obtuse or rounded, ciliate, about 5-nerved, 2–2.5 mm. long, 1.2–1.8 mm. wide; rays probably 5, greenish-yellow, bidentate, 3-nerved, about 1.3 mm. long, much shorter than the body of the fruit appendage; disk flowers about 3, their corollas greenish yellow, 1.3 mm. long, 4 or 5-toothed, the teeth bearing an internal apical tuft of hairs; pales oval, obtuse, scarious, glabrous, 1.3 mm. long, bearing a subterminal oblong central gland; fruit body ribbed and corrugate on the sides, about 1.5 mm. long, 1.3 mm. wide, the hood ovate, sparsely hispidulous-ciliate, sometimes muticous, obtuse, and about 1.2 mm. long, usually acuminate, about 2 mm. long and 1.6 mm. wide, and prolonged into a slender recurved sparsely hispidulous horn about 3.5 mm. long.

MEXICO: Alzada, Colima, 4 Nov. 1910, *C. R. Orcutt* 6601 (TYPE no. 1,209,590, U. S. Nat. Herb.).

Related to *Melampodium longicornu* A. Gray, which has similar heads and fruit, but is distinguished by its narrowly elliptic to lance-elliptic, sessile or subsessile leaves.

BOTANY.—*Venezuelan species of Valeriana, section Porteria.*[1] H. PITTIER, Caracas, Venezuela, and E. P. KILLIP, U. S. National Museum.

Two genera of the family Valerianaceae, *Porteria* Hook. and *Amblyorhinum* Turcz., were proposed in the year 1852, the former antedating the latter by a few months. A single species, *Porteria bractescens*, was described[2] by Hooker; five species were published[3] under *Amblyorhinum*. Both Hooker's *P. bractescens* and the first species mentioned under *Amblyorhinum* by Turczaninow, *A. grandiflorum*, which should be considered the type of this genus, were based on Linden's 424, from Caracas. Turczaninow, after he had prepared the manuscript of his paper, evidently became aware of Hooker's article, for he added a paragraph (p. 173) in which he changed the name of his first species to *Porteria bractescens*, and transferred the five other species to *Porteria*.

The characters which Hooker especially emphasizes in describing *Porteria* are the large imbricate bracts which almost completely con-

[1] Received July 3, 1926. Published by permission of the Secretary of the Smithsonian Institution.

[2] Hook. Icon. Pl. 9: pl. 864. 1852.

[3] Bull. Soc. Nat. Moscon. 25[2]: 173. 1852.

ceal the flowers, the bract-like leaves, the truncate, saucer-shaped epappose calyx-limb, inclined to the side, the attachment of the corolla laterally, its base forming a blunt spur, and, finally, the general shrubby aspect of the plant.

In an account[4] of South American Valerianaceae published in 1857, Weddell, evidently unaware of Turczaninow's work, described three new species in the genus *Phyllactis* Pers. (Group B), one of which, *Phyllactis cordifolia*, was based on Funck and Schlim's 1623, the type of *Amblyorhinum* (= *Porteria*) *spicatum* Turcz. The two other species were *Phyllactis mutisiana* and *P. pinnatifida*, both from Colombia.

As originally understood by Persoon,[5] *Phyllactis* included only stemless plants, with rosette leaves, involucrate flowers having a 3-lobed corolla, and epappose fruit. The extension of *Phyllactis*, either as a distinct genus or as subgenus of *Valeriana*, to include the species which we are discussing, is hardly justifiable.

Höck, in an elaborate monograph[6] of Valerianaceae, reunited *Phyllactis* and *Valeriana*, dividing the species enumerated by Weddell under *Phyllactis* among four sections. In the section *Porteria* was placed correctly *Valeriana bractescens* (Hook.) Höck; but Höck unfortunately included certain Ecuadorean species with a well-developed, pappose calyx.

Graebner's synopsis of Valerianaceae[7] contributed little to the correct interpretation of this particular group, for in his section of *Valeriana* to which he gave the name *Porteria* not a single one of the species originally described by Hooker or Turczaninow was mentioned.

It remained for Briquet in 1914[8] to formulate the most satisfactory interpretation of this group, and, in the main, the present paper is in accord with his treatment.

The question as to whether this small group of species, confined probably to the mountainous region of western Venezuela and eastern Colombia, constitutes a genus distinct from *Valeriana* or whether it is treated best as a well-marked section is difficult to determine at present. The calyx of *Valeriana* (wide sense) varies greatly, and these variations are not clearly associated with other characters. The spur near the base of the corolla tube, prominent in the original

[4] Chloris Andina 2: 28. 1857.
[5] Syn. 1: 39. 1805.
[6] Bot. Jahrb. Engler 3: 57. 1882.
[7] Bot. Jahrb. Engler 37: 445, 476. 1906.
[8] Ann. Conserv. Jard. Bot. Genève 17: 349-356. 1914.

species of the group, is much reduced in the other species; in at least two species it is scarcely more pronounced than in *Valeriana rusbyi*, *V. simplex*, *V. lyrata*, or *V. urticifolia* of various other sections. As Briquet observes, a restoration of the genus *Porteria* should be made only in a general monograph of Valerianaceae, based upon a complete study of the material in the large herbaria.

Recently certain species of this group have been re-collected in Venezuela, thus supplying data additional to those in Briquet's synopsis, and one new species has been found. It seems advisable to publish this information at the present time. Mr. Killip has had the opportunity of examining material of this group in several European herbaria.

KEY TO THE VENEZUELAN SPECIES

Leaves 2.5 cm. long or less.
  Leaves attenuate to a short petiole, crenulate or entire, more or less divaricate; corolla white; branches puberulent.
    Corolla 6–8 mm. long; leaves crenulate, not ciliolate . . **1. V. phylicoides.**
    Corolla 4–6 mm. long; leaves entire, minutely ciliolate . . **2. V. parviflora.**
  Leaves sessile, crenulate, appressed; corolla deep yellow; branches glabrous . . . . . **3. V. spicata.**
Leaves more than 2.5 cm. long.
  Leaves serrate or crenulate; corolla 1 cm. long or less.
    Bracts entire, 7 mm. ong or less; leaves oblong-linear, acute **4. V. triplinervis.**
    Bracts remotely dentate, 8–10 mm long; leaves obovate-oblong **5. V. foliosa.**
  Leaves entire; corolla more than 1 cm. long.
    Bracts subcordate, 2 cm. wide or more; leaves broadly lanceolate **6. V. bractescens.**
    Bracts linear-oblong, 0.5–1 cm. wide; leaves linear-lanceolate **7. V. meridana.**

1. VALERIANA PHYLICOIDES (Turcz.) Briq. Ann. Conserv. Bot. Jard. Genève **17:** 355. 1914. Fig. 1.
Amblyorhinum phylicoides Turcz. Bull. Soc. Bot. Moscou **25²:** 171. 1852.
Porteria phylicoides Turcz. Bull. Soc. Bot. Moscou **25²:** 173. 1852.
Porteria parviflora var. Trev. Bot. Zeit. **11:** 354. 1853.
Sierra Nevada de Mérida, 3250 m., June, 1847, *Funck & Schlim* 1529 (Paris, Geneva; type). Sierra Nevada de Santo Domingo, Mérida, 3600 m., Sept. 12, 1922, *Jahn* 1092 (Caracas, U. S. N. M.). Between Caracas and Mérida, *Linden* 365, in part (Paris).

2. VALERIANA PARVIFLORA (Trev.) Höck, Bot. Jahrb. Engler **3:** 57. 1882. Fig. 2.
Porteria parviflora Trev. Bot. Zeit. **11:** 354. 1853.
Between Caracas and Mérida, in 1843, *Linden* 365, in part (Paris, Geneva; type). Páramo de Piedras Blancas Mérida, 4000 m., Nov. 27, 1915, *Jahn* 425 (Caracas). Páramo de Timotes, 3000–4000 m., Sept. 4, 1921, *Jahn* 547 (Caracas), Jan. 21, 1922, *Jahn* 835 (Caracas, U. S. N. M.).

Valeriana parviflora is certainly distinct from *V. phylicoides*. The leaves are entire, usually minutely pubescent near the margin (floral leaves or bracts ciliolate), and loosely imbricate; in *V. phylicoides* they are distinctly crenulate, glabrous throughout, and closely imbricate.

In the herbarium of the Muséum d'Histoire Naturelle, Paris, there is a specimen of *Linden* 365, which corresponds excellently with the description of *V. parviflora* and with *Jahn's* 835, which was taken to Europe for comparison. On another sheet at Paris two collections are mounted, *Funck & Schlim* 1529, and another Linden plant, the label of which bears the same locality data as the *Linden* 365 sheet; a small slip with the number "365" is pasted on this sheet with the two specimens. The two plants appear to belong to the same species; they are not of the same species as the *Linden* 365 which is mounted by itself; they agree well with *Jahn's* 1092 which was likewise taken over for comparison. Probably Linden collected two distinct species under his no. 365, but possibly the slip with the number 365 has been placed wrongly on the sheet.

3. VALERIANA SPICATA (Turcz.) Briq. Ann. Conserv. Bot. Jard. Genève **17:** 354. 1914. Fig. 7.
Amblyorhinum spicatum Turcz. Bull. Soc. Bot. Moscou **25**[2]: 170. 1852.
Porteria spicata Turcz. Bull. Soc. Bot. Moscou **25**[2]: 173. 1852.
Phyllactis cordifolia Wedd. Chlor. And. **2:** 32. 1857.
Porteria rotundifolia Karst. Fl. Columb. **2:** 99. *pl. 151, f. 8–10.* 1862–69.
Valeriana cordifolia Höck, Bot. Jahrb. Engler **3:** 54. 1882.
Sierra Nevada de Mérida, 3250 m., June, 1847, *Funck & Schlim*, 1623 (Paris, Geneva; type, also type of *Phyllactis cordifolia*). Trujillo, *Linden* 411 (Geneva).

4. VALERIANA TRIPLINERVIS (Turcz.) Briq. Ann. Conserv. Bot. Jard. Genève **17:** 353. 1914. Fig. 5.
Amblyorhinum triplinerve Turcz. Bull. Soc. Bot. Moscou **25**[2]: 170. 1852.
Porteria triplinervis Turcz. Bull. Soc. Bot. Moscou **25**[2]: 173. 1852.
Sierra Nevada de Mérida, Mérida, 3350 m., June, 1847, *Funck & Schlim* 1551 (Paris, Geneva; type).

5. **Valeriana foliosa** Pittier & Killip, sp. nov. FIGS. 3, 4.
Planta fruticosa, trunco brevi vel brevissimo, 2–3-furcato, caulibus basi aphyllis glaberrimis, supra breve ramosis dense foliosis plus minusve rufo-pilosis; foliis subcoriaceis, sessilibus, semi-amplexicaulibus, obovato-oblongis, basin versus attenuatis, apice subacutis, apicem versus serratis, trinerviis nervibus penniveniis, supra glaberrimis subtus ad nervos pilosis; inflorescentiis terminalibus, brevibus, dense bracteosis; bracteis ovatis, reticulatis, supra glaberrimis, lucidis, subtus ad nervos pilosis, margine sinuato-dentatis, ciliatis; bracteolis lanceolatis sparse pilosulis, interdum remote dentatis; floribus sessilibus, calyce glabro, apice limbo angustissimo minute sinuato coronato; corolla albovirescente, bracteis brevior, apice 5-lobulata, extus glabra intus sparse pilosa; staminibus inclusis; stylo apice breve trilobulato; caetera ignota.
Caulis 30–50 cm. altus, 0.5 cm. crassus. Folia 3–5 cm. longa, 0.7–1.3 cm. lata. Bracteae 1.4 cm. longae, 0.8–1 cm. latae; bracteolae basi leviter

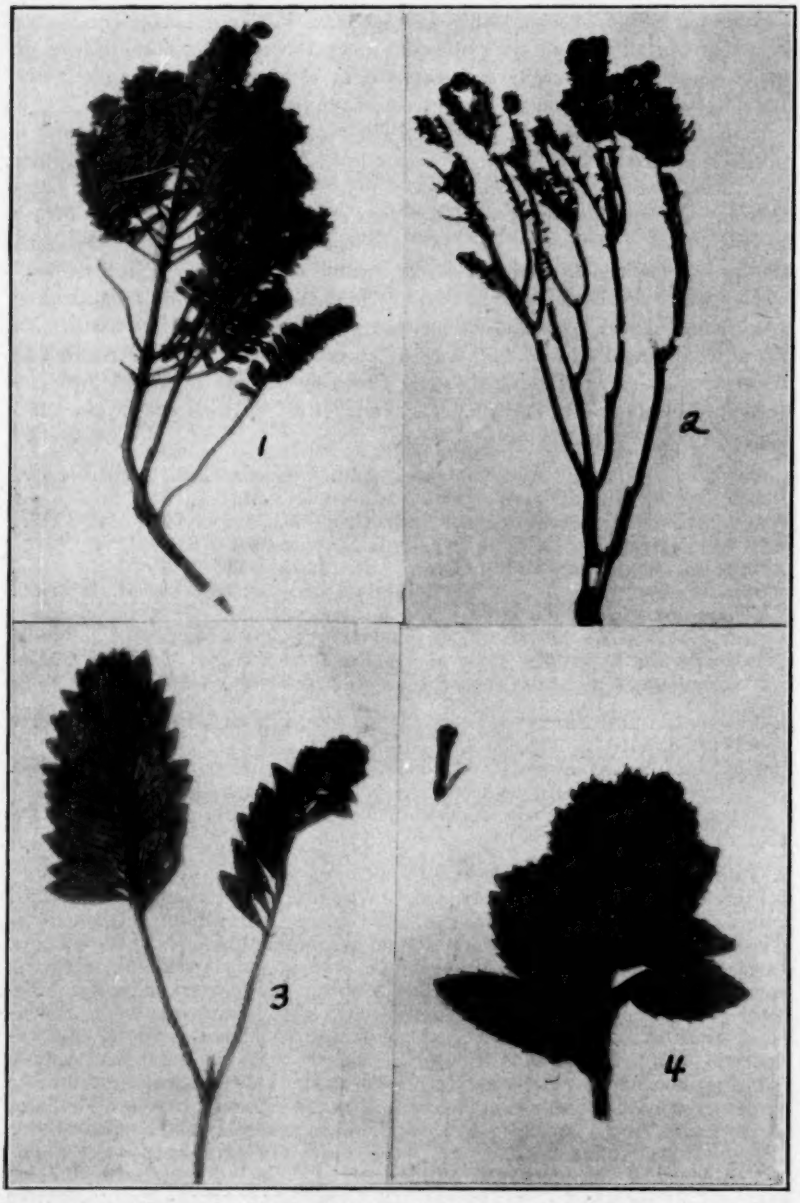

Fig. 1.—*Valeriana phylicoides* (*Jahn* 1092); 2.—*V. parviflora* (*Linden* 363); 3, 4.—*V. foliosa* (type). (1, 2, 3, about ½ nat. size; 4, 1.5 nat. size.)

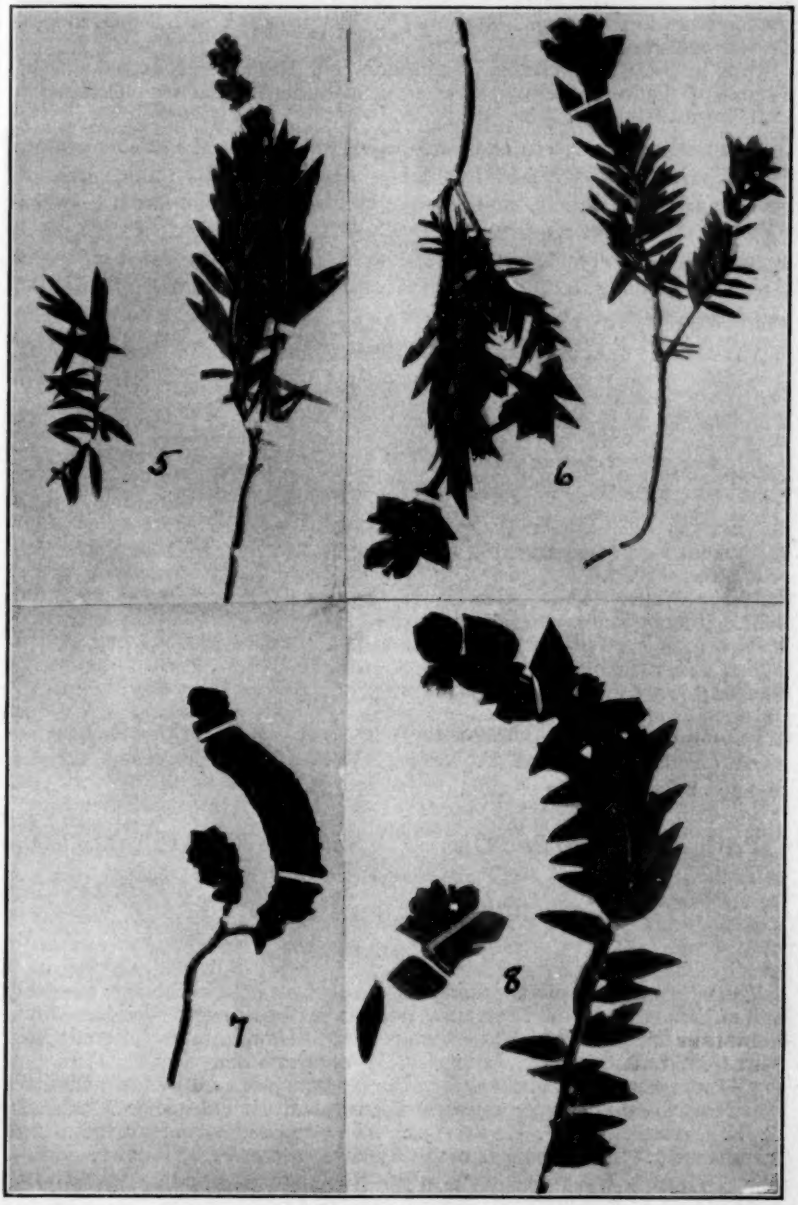

Fig. 5.—*Valeriana triplinervis* (F. & S. 1551); 6.—*V. meridana* (F. & S. 1540); 7.—*V. spicata* (F. & S. 1623); 8.—*V. bractescens* (*Linden* 424). (All about ½ nat. size.)

connatae usque ad 7.5 mm. longae, 1.4 mm. latae; calyx circa 2 mm. longus. Corolla 6–8 mm. longa.

Type in the U. S. National Herbarium, no. 1,186,558, collected on the Páramo de Quirorá, Mérida, Venezuela, altitude 3200 meters, October 8, 1921, by A. Jahn (no. 718).

This species belongs to the large-leaved group, from the other members of which it is distinguished by serrate leaves, hirsute on the nervation beneath, dentate bracts, and by the dimensions of the flower. Unfortunately, the meager specimens at hand give only a poor idea of the general appearance of the plant. Dr. Jahn describes it as being formed of two or three stems issuing from a very short trunk, or from a trunkless rootstock, and not more than 50 cm. high.

6. VALERIANA BRACTESCENS (Hook.) Höck, Bot. Jahrb. Engler **3**: 57. 1882. Fig. 8.

Porteria bractescens Hook. Icon. Pl. **9**: *pl. 864*. 1852.

Amblyorhinum grandiflorum Turcz. Bull. Soc. Bot. Moscou **25**[2]: 168. 1852.

Sierra Nevada de Mérida, 3000 m., in 1842, *Linden* 424 (Kew, Paris; type, also type of *Amblyorhinum grandiflorum*); *Funck & Schlim* 1515 (Paris, Geneva).

7. VALERIANA MERIDANA Briq. Ann. Conserv. Bot. Jard. Genève **17**: 353. 1914. Fig. 6.

Amblyorhinum angustifolium Turcz. Bull. Soc. Bot. Moscou **25**[2]: 169. 1852. Not *Valeriana angustifolia* Mill., 1768.

Porteria bractescens var. Trev. Bot. Zeit. **11**: 354. 1853.

Sierra Nevada de Mérida, 2800–3300 m., *Funck & Schlim* 1540 (Paris, Geneva; type).

In addition to these Venezuelan species, two Colombian plants, *V. mutisiana* (Wedd.) Höck and *V. karstenii* Briq. (*Porteria pubescens* Karst.), perhaps belong to this section.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

BIOLOGICAL SOCIETY

691ST MEETING

The 691st meeting of the Biological Society was held in the new assembly hall of the Cosmos Club March 27, 1926, at 8:10 p.m., with President OBERHOLSER in the chair and 80 persons present. New members elected: Mrs. MAY C. WILLIAMS SETTLE, Colonel R. MEINERTZHAGEN.

The secretary read the changes in the By-laws proposed by the committee appointed to consider this subject, consisting of H. H. T. JACKSON, Chairman, T. E. SNYDER, and B. H. SWALES. The proposed changes were passed unanimously. These changes in the By-laws are worded as follows:

That the words "The President shall not be eligible for immediate re-election" be stricken from the first paragraph, Art. II, of the By-Laws, so that the paragraph shall read: "The President shall preside at the meetings of the Society and of the Council.

He shall appoint all committees except such as are otherwise provided for; and, jointly with the Recording Secretary, shall sign all written contracts and other obligations of the Society. In the absence of the President, his duties shall be performed by one of the Vice-Presidents."

That in the first paragraph of Art. III, the word "calendar" be inserted before "year," and the words "one year" before "in" so that the paragraph shall read: "The annual dues of active and corresponding members shall be one dollar and fifty cents, payable at the beginning of the calendar year, and no member one year in arrears shall be entitled to vote at the annual meeting for the election of officers or on any proposed amendments to the Constitution or By-Laws."

That in the sixth paragraph of Art. IV, the word "December" be changed to "the spring" so that the paragraph shall read: "The annual meeting for the election of officers shall be the last stated meeting in the spring."

That the following paragraph be added to Article V: "The official term of all officers shall commence at the close of the meeting at which they are elected."

T. S. PALMER reported the first box turtles appearing from hibernation in the city on March 24 and 25, one on a southern exposure and one on a northern exposure.

ERNEST P. WALKER, Biological Survey: (*The wild life of Alaska and its protection* (illustrated).—The work of protecting Alaska's wild life may be likened to managing a gigantic livestock range. From her most mosquito-infested swamp to the tops of her highest peaks Alaska is preeminently a livestock country. As a whole we have found no animals better suited to the range than the wild stock native to the region.

The game animals and game birds furnish much valuable meat to Alaskans and throughout the greater portion of the Territory are the only source of fresh meat. The game animals are important attractions to non-resident big game hunters and the annual fur harvest is worth about $2,000,000, and by proper management can be increased at least tenfold with correspondingly increased profits. The waterfowl probably benefit the sportsmen of the western States even more than they do the Alaskans.

The great extent of the stock range is best illustrated by superimposing a map of Alaska on one of the United States of the same scale which places the easternmost portion at the Georgia coast and the tip of the Aleutian Islands near Los Angeles. Some lands of Alaska do not have certain game and fur animals which are well suited to such lands. The Alaska Territorial Legislature appropriated and made available to the Alaska Game Commission in the spring of 1925, $10,000, for stocking such lands. Operations under this appropriation to date have consisted in placing beaver and muskrats on the Kodiak-Afognak Islands group. Protective work is receiving good support from Alaskans. Cooperative policing is carried on with the adjacent Canadian provinces of British Columbia and Yukon Territory. As a whole the future is bright for increasing the supply of Alaska wild life. Slides were shown of deer, moose, bear, mountain sheep, caribou, beaver, mink, marten, muskrat, rabbit, sea lion, ptarmigan, grouse, eagle, scenery, and miscellaneous subjects. (*Author's abstract.*)

EDGAR T. WHERRY, Bureau of Chemistry: *Exploring for wild flowers in the Gulf States* (illustrated).—The trip described was taken in company with Dr. J. K. SMALL of the New York Botanical Garden to obtain data as to distribution of native plants, especially in the south central states (Louisiana, Texas, Oklahoma, and Arkansas), in preparation for publishing a complete revision of Small's "Flora of the Southeastern United States." Transportation was by automobile, and 7,000 miles were covered in 7 weeks. The

route was from Cape Sable, Florida, around the Gulf coast to Brownsville, Texas, then to El Paso, Texas, and eastward by a more northern line through Oklahoma, Arkansas, northern Louisiana, and back to Florida. Although the limited time available made frequent stops impossible, many species were collected and data as to their habitat obtained. Particular attention was paid to *Iris*, and a considerable number of undescribed species were discovered; roots have been sent to the New York Botanical Garden and when the plants flower, they will be painted and described. New species in several other genera were also found, and many extensions of range established.

The speaker had taken photographs of many of the plants seen, using a 4 x 5 camera with only a low-priced lens, but with long bellows and swing-back. Commercial orthochromatic cut films were used throughout, and were highly satisfactory, even for yellow and red flowers, for which an orange ray-screen was employed. Color notes were taken in the field, and 75 lantern slides made from the negatives obtained, painted with transparent water-colors, were shown. (*Author's abstract.*)

692D MEETING

The 692d meeting was a joint meeting with the Audubon Society of the District of Columbia and was held April 10, 1926 at 8:00 p.m., in the auditorium of the National Museum, with President T. S. PALMER of the Audubon Society in the chair and 200 persons present. The program consisted of the following papers:

A. O. GROSS, Bowdoin College: *The threatened extinction of the heath hen on Martha's Vineyard* (illustrated).—In Colonial times the heath hen (*Tympanuchus cupido*) ranged from Maine to Carolina. By 1840 it had disappeared from the mainland of Massachusetts and Connecticut. In 1868 there were still a few on Long Island and in New Jersey, but since 1870 it has existed only on Martha's Vineyard. Brewster in 1890 estimated the number of birds at 150 to 200. In 1906 there were less than 100. By 1916 the number had increased to about 2,000. A great fire in the spring of 1916 destroyed many nests and much of the birds' natural cover, and during the next winter the number was reduced by hawks and other causes to about 150. In 1917 there were about 300, but in 1925 the number was reduced to about 25. The Federation of New England Clubs secured the services of a special warden, and by 1926 the number has increased to about 35. The speaker hopes that under the care of this warden the heath hen may be preserved from extinction. Views were shown of some of the birds and of the heath hen reservation.

A. O. GROSS: *The jungle life of Panama* (illustrated).—The speaker spent several months in 1925 studying the bird and animal life on Barro Colorado Island in the Canal Zone. He showed numerous views of the city of Panama and the Canal Zone and of its distinctive birds and animals. Most of the smaller birds lay only two eggs, in decided contrast with the birds of the temperate zone.

S. F. BLAKE, *Recording Secretary.*

ANTHROPOLOGICAL SOCIETY

597TH MEETING

The 597th meeting of the Society was held in the United States National Museum on April 20, 1926.

Program: Dr. WALTER HOUGH: *Fifty years of Pueblo Archeology.* Exploration during the past fifty years in the Pueblo region forms an interesting history. Veterans of the discovery of the cliff-dwellings in 1874–75 are still with us, W. J. JACKSON, who discovered and photographed, and W. H. HOLMES, who first sketched and pictured them in oils. As this work on the Southwest archeology was carried on by the U. S. Geological Survey and the Bureau of American Ethnology almost exclusively until recent years, it is observed that more than half of the investigators were members of the Anthropological Society of Washington.

In the period of reconnaissance beginning in 1869 the names of HOLMES, JACKSON, YARROW, POWELL, STEVENSON, BANDELIER, and CUSHING stand out prominently. Beginning in 1879 work in all the branches of anthropology was actively prosecuted by the Bureau of Ethnology. In 1886 the MINDELEFFS studied the architecture of the ancient and modern pueblos over a wide region, furnishing invaluable data. Exploration in the sense of excavation of ruins began in the 80's. CUSHING carried on exploration work on a large scale in the lower Salt River Valley and also collected archeologica at Zuni. Historically, the first ruin explored was at St. George, Utah, in 1869–70 by EDWARD PALMER, a most indefatigable collector. The St. George specimens are in the National Museum and the Peabody Museum at Cambridge, Mass. In 1894 NORDENSKIJÖLD published the results of his exploration of Mesa Verde cliff-dwellings. This work is a landmark. In the 90's Dr. J. WALTER FEWKES entered the field, exploring a ruin called Skyatki on the Hopi Reservation. Dr. FEWKES continued his researches for many years and is still active. In this period came HOUGH, HEWETT, MOOREHEAD, DORSEY, OWENS, PEPPER, HRDLICKA, PRUDDEN, and others.

The period of more intensive exploration presents the names of KIDDER, NELSON, MORRIS, JUDD, CUMMINGS, SPIER, GUERNSEY, JEANCON, sent out by different institutions. In this period methods depending on a classification of sherds, the presence or absence of pottery, stratification and superposition, have cast much light on the history of the ancient peoples of the southwest. We have here a good example of the normal development of research in the past 50 years. The order of culture in the ancient pueblos is now tentatively *basket maker*, *post-basket maker*, *pre-pueblo*, *pueblo*, and *recent*. Much is to be expected of the active and enthusiastic workers of the present in clearing up the problems of Pueblo archeology, and the best wishes of the Old Guard go with them.

The modern phase of pueblo exploration which was formerly impracticable in the vast field to be covered is seen in the National Geographic Society's work at Pueblo Bonito under the direction of NEIL M. JUDD, and Dr. A. V. KIDDER's work for Phillips Academy, Andover, Mass., at Pecos. It is seen that great financial resources are necessary to uncover and explore thoroughly one relatively large ruin. This, however, is the only way to elicit the further story of ancient Pueblo Indian life.

JOHN M. COOPER, *Secretary.*

SCIENTIFIC NOTES AND NEWS

Dr. A. S. HITCHCOCK attended the International Congress of Plant Sciences recently held at Ithaca, where he gave a paper by invitation and led the round-table discussion on nomenclature. He was appointed a member of the International Committee on Nomenclature.

Mr. T. A. SPRAGUE, of the Kew Herbarium, London, England, spent a week at the U. S. National Herbarium studying the *Dilleniaceae*, after attending the International Congress of Plant Sciences at Ithaca.